

# PNP Germanium Transistors

SIEMENS AKTIENGESELLSCHAFT C 04035 D

AC 151  
AC 151 r

T-29-11

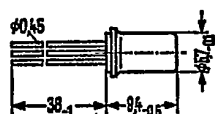
for AF input and driver stages of medium performance

AC 151 and AC 151 r are alloyed germanium PNP transistors in 1A 3 DIN 41871 case (similar to TO-1).

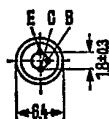
The leads of these transistors are electrically insulated from the case. The collector terminal is marked by a red dot at the rim of the case. A fixing part (heat sink<sup>1)</sup>) is provided for fixing on the chassis; it has to be ordered separately.

Not for new design

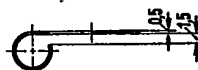
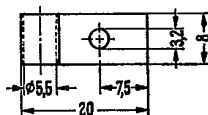
Type	Ordering code
AC 151 IV	Q60103-X151-D
AC 151 rIV	Q60103-X151-D1
AC 151 V	Q60103-X151-E
AC 151 rV	Q60103-X151-E1
AC 151 VI	Q60103-X151-F
AC 151 rVI	Q60103-X151-F1
AC 151 VII	Q60103-X151-G
Heat sink	Q62901-B1



Approx. weight 1 g



Dimensions in mm



Approx. weight 2 g

## Maximum ratings

Collector-emitter voltage  
Collector-emitter voltage  
( $V_{BE} \geq 0.2$  V)  
Collector-base voltage  
Emitter-base voltage  
Collector current  
Base current  
Junction temperature  
Storage temperature range  
Total power dissipation

	AC 151 AC 151 r	
$-V_{CEO}$	24	V
$-V_{CEV}$	32	V
$-V_{CBO}$	32	V
$-V_{EBO}$	10	V
$-I_C$	200	mA
$-I_B$	40	mA
$T_j$	90	°C
$T_{stg}$	-55 to +75	°C
$P_{tot}$	900	mW

## Thermal resistance

Junction to ambient air  
Junction to case

$R_{thJA}$	$\leq 300$	K/W
$R_{thJC}$	$\leq 50$	K/W

<sup>1)</sup> Thermal resistance between transistor case and heat sink below the fixing screw at careful mounting:  $R_{th} \leq 10$  K/W

T-29-11

**Static characteristics** ( $T_{amb} = 25^\circ\text{C}$ )<sup>3)</sup>

Collector-emitter saturation voltage

( $-I_C = 200\text{ mA}$ ;  $h_{FE} = 20$ )

Collector-emitter saturation voltage

Collector cutoff current ( $V_{CBO} = 10\text{ V}$ )Collector cutoff current ( $V_{CBO} = 32\text{ V}$ )Collector cutoff current ( $-V_{CEV} = 32\text{ V}$ ;( $V_{BE} \geq 0.2\text{ V}$ )Emitter cutoff current ( $-V_{EBO} = 10\text{ V}$ )

	AC 151 AC 151 r	
$-V_{CEsat}$ <sup>1)</sup>	0.13 (<0.22)	V
$-V_{CEsat}$	0.25 (<0.4) <sup>2)</sup>	V
$-I_{CBO}$	<10	$\mu\text{A}$
$-I_{CBO}$	6 (<25)	$\mu\text{A}$
$-I_{CEV}$	6 (<25)	$\mu\text{A}$
$-I_{EBO}$	4 (<25)	$\mu\text{A}$

**Dynamic characteristics** ( $T_{amb} = 25^\circ\text{C}$ )

Cutoff frequency

( $-I_C = 1\text{ mA}$ ;  $-V_{CE} = 5\text{ V}$ )

Transition frequency

Base intrinsic resistance

Collector-junction capacitance

Noise figure ( $-I_C = 0.5\text{ mA}$ ;  $-V_{CE} = 5\text{ V}$ ; $f = 200\text{ Hz}$ ;  $R_g = 500\ \Omega$ ;  $f = 1\text{ kHz}$ )

	AC 151	AC 151 r	
$f_{hfe}$	15	15	kHz
$f_T$	1.5	1.5	MHz
$r_{bb'}$	75	75	$\Omega$
$C_{b'e}$	27	27	pF
NF	4 (<10)	3 (<6)	dB

The transistors AC 151 and AC 151r are grouped according to the small signal current gain  $h_{fe}$  and marked by Roman numerals.

Operating point: ( $-I_C = 2\text{ mA}$ ;  $-V_{CE} = 1\text{ V}$ ;  $f = 1\text{ kHz}$ )

$h_{fe}$ group	IV	V	VI	VII	
Type	AC 151 r	AC 151 r	AC 151 r	—	
	AC 151	AC 151	AC 151	AC 151	
$h_{11e}$	0.75 (0.4 to 1.3)	1.2 (0.6 to 2.1)	1.8 (1.0 to 3.2)	2.7 (1.7 to 5.3)	k $\Omega$
$h_{12e}$	9 (<20)	13 (<25)	16 (<28)	19 (<30)	$10^{-4}$
$h_{21e}$	45 (30 to 60)	75 (50 to 100)	110 (75 to 150)	170 (125 to 250)	—
$h_{22e}$	100 (<200)	140 (<250)	160 (<280)	160 (<300)	$\mu\text{S}$

1) The transistor is overloaded to such a degree that the DC current gain decreases to  $h_{FE} = 20$ .

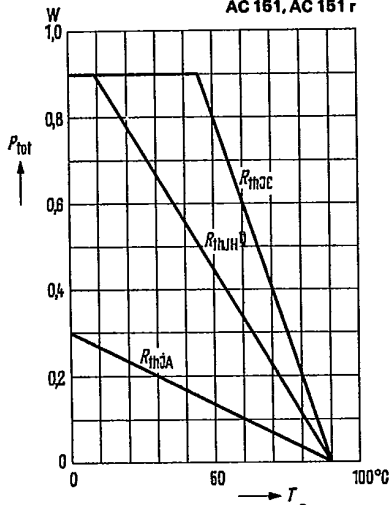
2) ( $-I_C = 200\text{ mA}$  for the characteristic which, at a constant base current, intersects the operating point, where  $-I_C = 200\text{ mA}$ ;  $-V_{CE} = 0.5\text{ V}$ )

3) See also next page

T-29-11

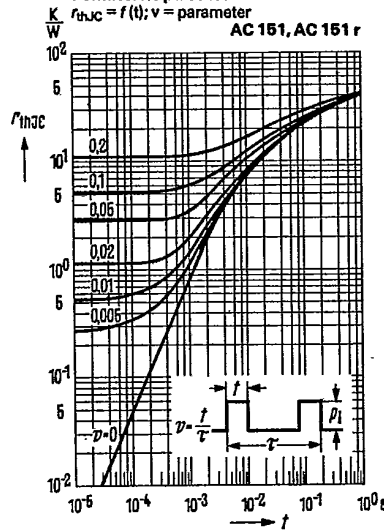
Total perm. power dissipation  
versus temperature  
 $P_{tot} = f(T)$ ;  $R_{th}$  = parameter

AC 151, AC 151 r


1) Heat sink: aluminum 12.5 cm<sup>2</sup> x 2 mm

Permissible pulse load  
 $i_{thJC} = f(t)$ ;  $v =$  parameter

AC 151, AC 151 r

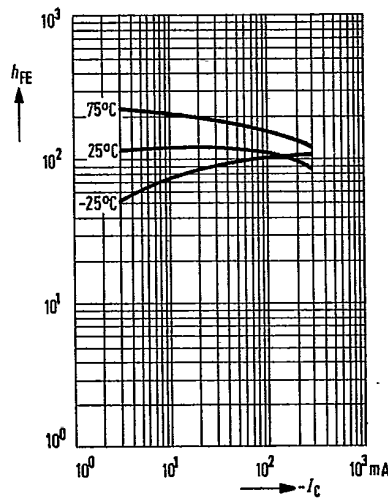


Static characteristics ( $T_{amb} = 25^\circ\text{C}$ )  
 $-V_{CE} = 0.5\text{ V}$

Type	AC 151, 151 r		
$-I_C$ mA	$-I_B$ mA	$h_{FE}$ $I_C/I_B$	$-V_{BE}$ V
2	0,043	47	0,125 ( $<0,2$ )
10	0,2	50	0,18 ( $<0,3$ )
50	—	—	—
100	2,222	45	0,32 ( $<0,55$ )
200	5	40	0,39 ( $<0,7$ )

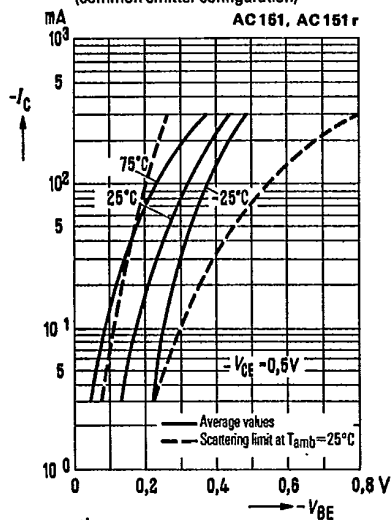
DC current gain  $h_{FE} = f(I_C)$   
 $-V_{CE} = 0.5\text{ V}$ ;  $T_{amb} =$  parameter  
(common emitter configuration)

AC 151, AC 151 r

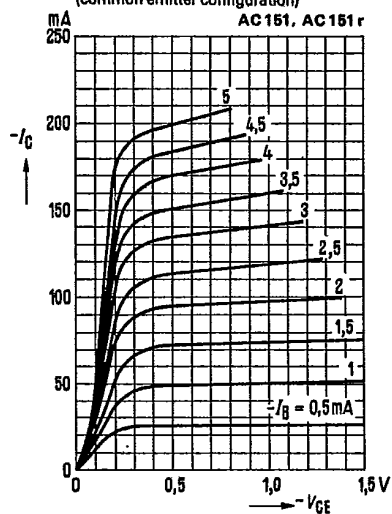


T-29-11

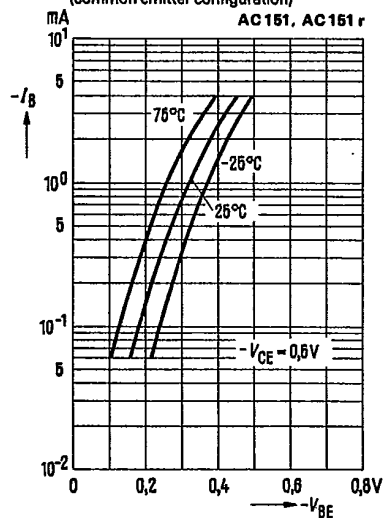
Collector current  $I_C = f(V_{BE})$   
 $-V_{CE} = 0.5 \text{ V}$ ;  $T_{amb} = \text{parameter}$   
 (common emitter configuration)



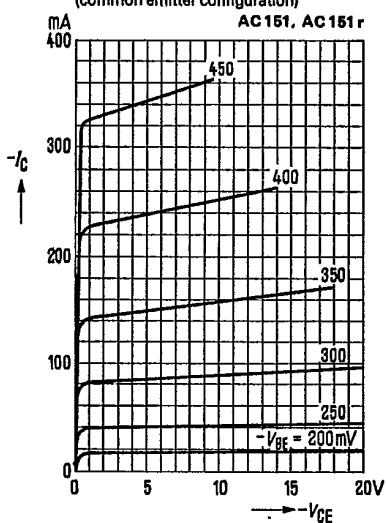
Output characteristics  
 $I_C = f(V_{CE})$ ;  $I_B = \text{parameter}$   
 (common emitter configuration)



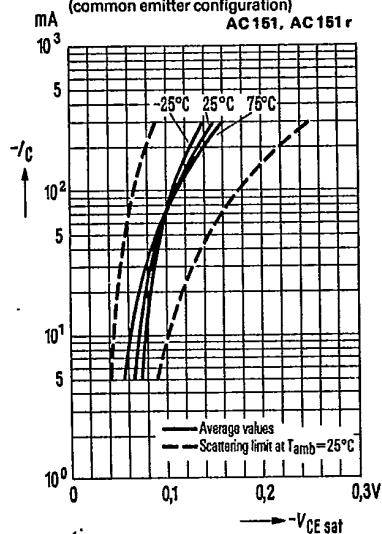
Input characteristics  $I_B = f(V_{BE})$   
 $-V_{CE} = 0.5 \text{ V}$ ;  $T_{amb} = \text{parameter}$   
 (common emitter configuration)



Output characteristics  
 $I_C = f(V_{CE})$ ;  $V_{BE} = \text{parameter}$   
 (common emitter configuration)



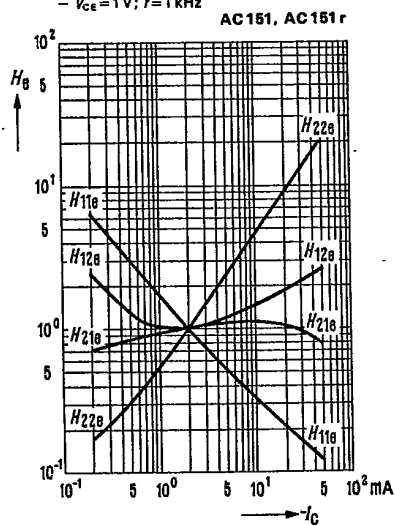
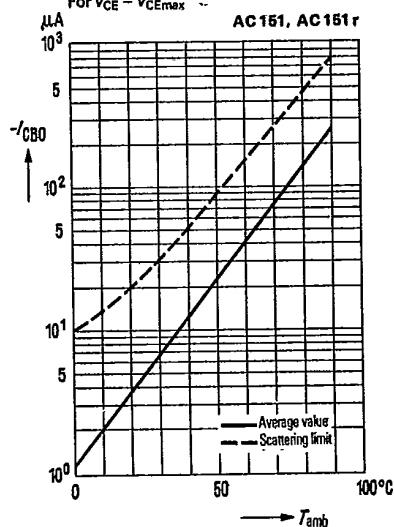
T-29-11

Collector-emitter saturation voltage  
 $V_{CEsat} = f(I_C); h_{FE} = 20$   
(common emitter configuration)

h-parameter versus collector current

$$H_e = \frac{h_e(I_C)}{h_e(I_C = -2\text{ mA})} = f(I_C)$$

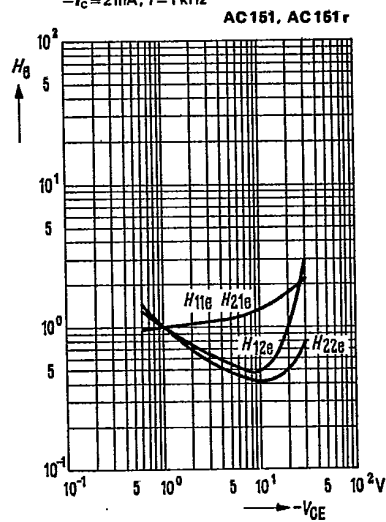
—  $V_{CE} = 1\text{ V}; f = 1\text{ kHz}$

Collector cutoff current versus  
temperature  $I_{CBO} = f(T_{amb})$   
For  $V_{CE} = V_{CEmax}$ 

h-parameter versus collector-emitter voltage

$$H_e = \frac{h_e(V_{CE})}{h_e(V_{CE} = -1\text{ V})} = f(V_{CE})$$

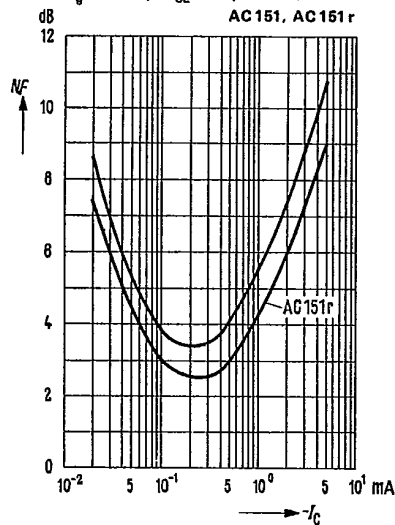
—  $I_C = 2\text{ mA}; f = 1\text{ kHz}$



T-29-11

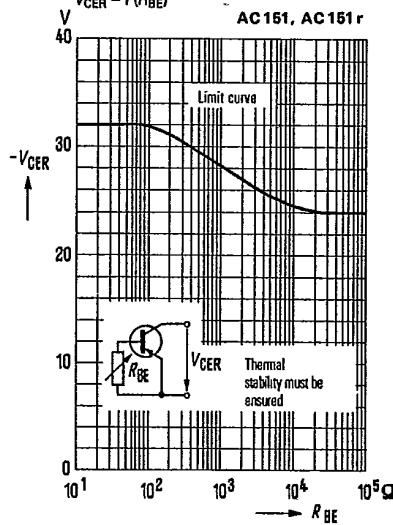
Noise figure versus  
collector current  $NF = f(I_C)$   
 $R_g = 500 \Omega$ ;  $-V_{CE} = 5 \text{ V}$ ;  $f = 1 \text{ kHz}$

AC 151, AC 151 r



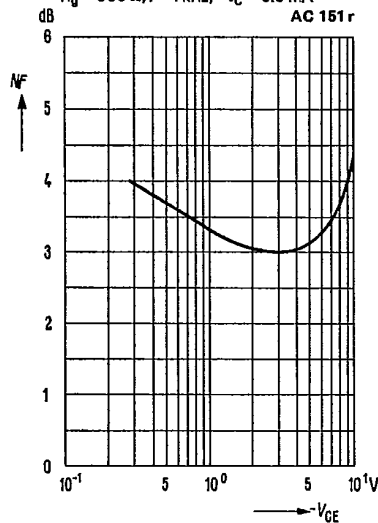
Collector-emitter voltage  
 $V_{CER} = f(R_{BE})$

AC 151, AC 151 r



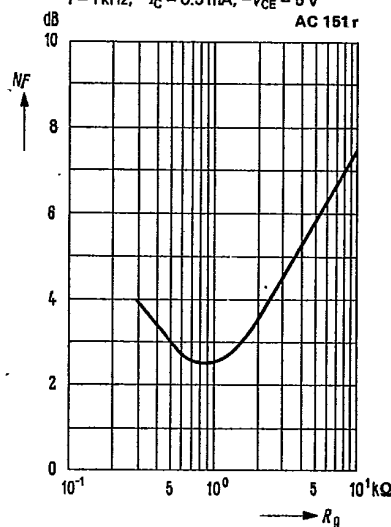
Noise figure versus collector-emitter  
voltage  $NF = f(V_{CE})$   
 $R_g = 500 \Omega$ ;  $f = 1 \text{ kHz}$ ;  $-I_C = 0.5 \text{ mA}$

AC 151 r



Noise figure versus internal resistance  
of generator  $NF = f(R_g)$   
 $f = 1 \text{ kHz}$ ;  $-I_C = 0.5 \text{ mA}$ ;  $-V_{CE} = 5 \text{ V}$

AC 151 r



1516

C-13